

# Boost Manufacturing Productivity

*with Precise Position Encoder Solutions*

Precise position and torque control enables higher quality and faster machining of complex components, thereby increasing throughput and manufacturing productivity, while also optimizing energy usage. Analog Devices holds the key enabling technologies to help customers accelerate time to market, while delivering high performance position encoder solutions. These technologies include precision converters for advanced control loop performance, high efficiency, highly integrated power management technology to overcome the thermal challenges of space-constrained housing and robust connectivity solutions, ideal for use in harsh industrial deployments.



Improve Process &  
Product Quality



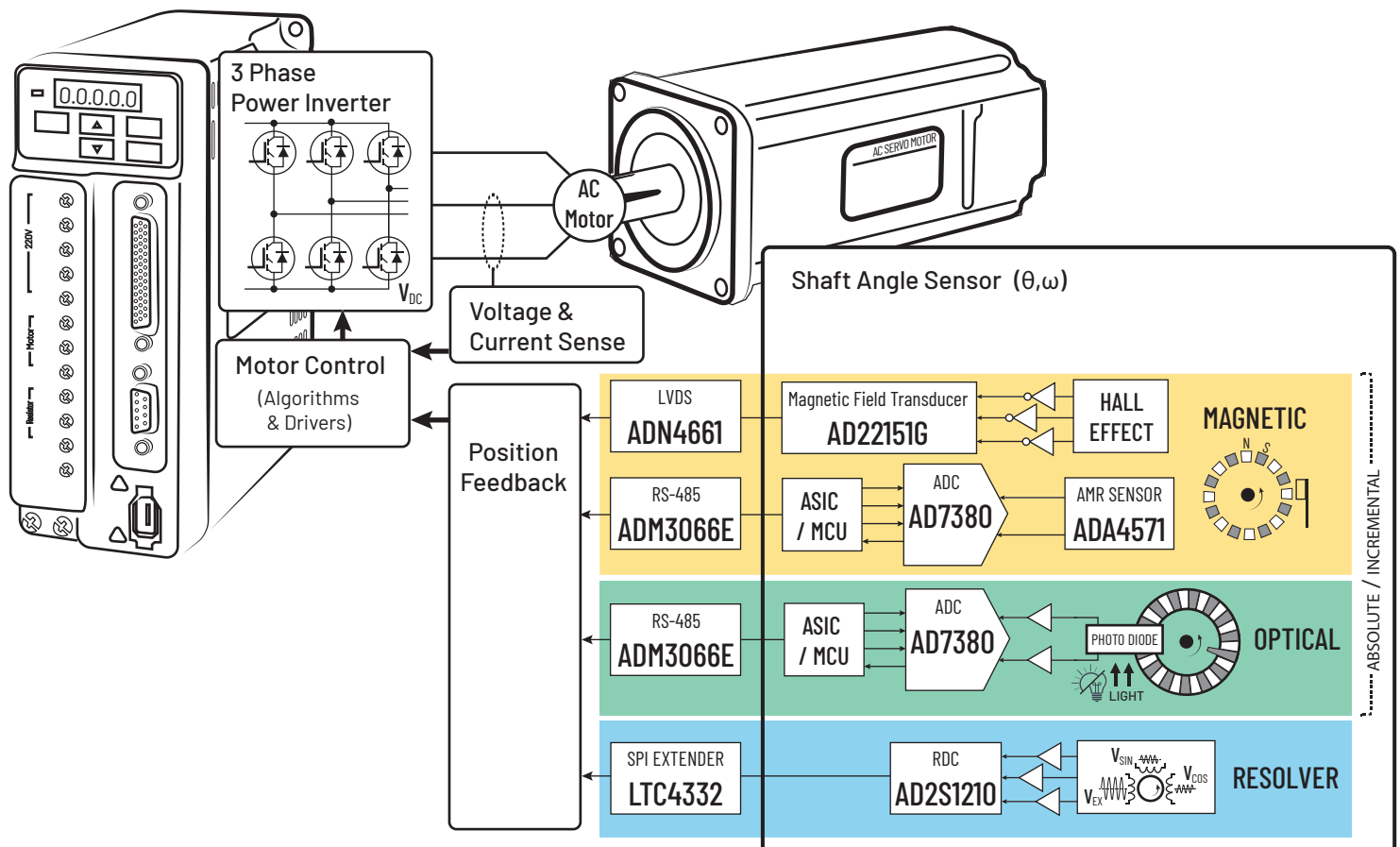
Increase  
Productivity



Optimize Energy  
Usage



Enable Small Form  
Factor Solutions

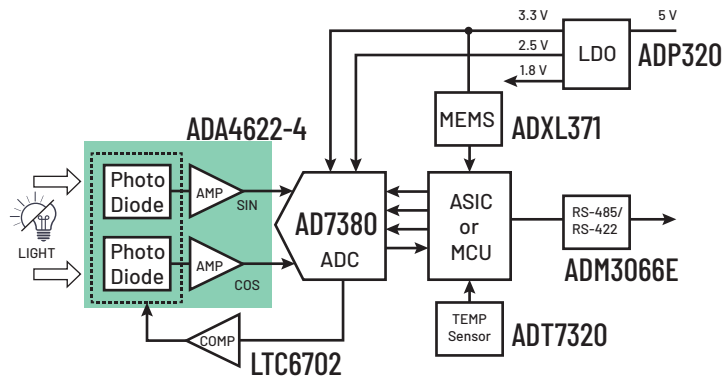


## Optical and Magnetic Encoders

Multi-rail low noise LDOs such as the **ADP320**, **LT3023**, and **LT3029** are used to power all components in optical and magnetic encoder signal chains. The **ADM3066E** RS-485 transceiver features ultra low transmitter and receiver skew performance, making these devices ideal for transmission of a precision clock. The high throughput rate and simultaneous sampling capabilities of the **AD7380** 4 MSPS SAR ADC enable on-chip oversampling, resulting in higher angular position accuracy. Depending on the needs of the application, alternative ADC options are shown in Table 1. For applications requiring resolutions of 12 bits or less, the **MAX32672** ultra-low-power Arm Cortex-M4F microcontroller includes a 12-bit 1 MSPS ADC with enhanced security, peripherals, and power management interfaces.

ADC	Bits
<b>AD7760</b>	24
<b>AD7380 / MAX11198</b>	16
<b>MAX11195</b>	14
<b>AD7866 / MAX11192</b>	12

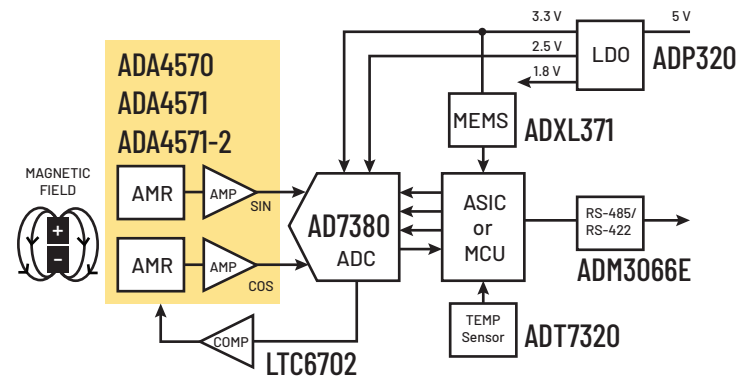
Table 1: ADC Options



The **ADA4622-4** quad rail-to-rail op-amp with input EMI filters for increased signal robustness is ideally suited to optical encoders. It includes a strong output drive to improve settling time performance and enable direct drive of the **AD7380** SAR ADC inputs.

## Resolver Encoders

For resolver encoders, the **AD2S1210** is a complete monolithic resolver-to-digital converter with a wide temperature range (-40 °C to 125 °C). **AD8694** amplifiers are used to create a third-order Butterworth low pass filter to pass the resolver signals to the **AD2S1210**. The **LTC4332** SPI extender enables system partitioning, providing the option of placing the microcontroller at the servo drive, rather than at the encoder, saving space and reducing design complexity.



For magnetic encoders, the **ADA4571** – an anisotropic magnetoresistive (AMR) sensor – integrates signal conditioning amplifiers and ADC drivers improving reliability, in addition to reducing size and weight. Angular accuracy of 0.1° typical angular error enhances closed loop control, and reduces motor torque ripple and noise.

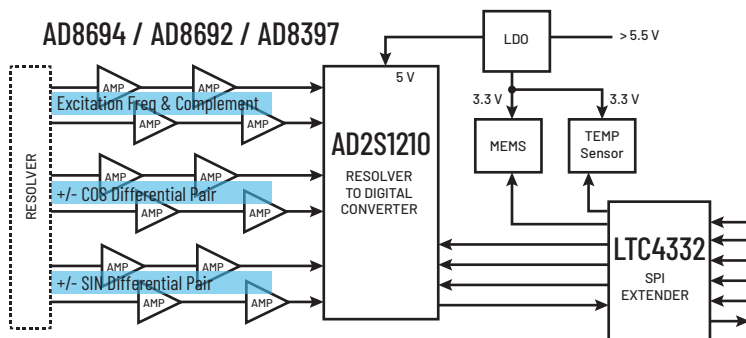
## Robust Connectivity

For reliable data transmission at high data rates over long cables, jitter and skew performance are critical. The **ADM3066E/ADM3067E** half/full duplex RS-485 transceivers are suitable for use with common motor encoding protocols such as SSI, BiSS, EnDat 2.2 and Hiperface DSL. With ultra low transmitter and receiver skew performance, and high common mode transient immunity (CMTI), they are ideal for use in harsh industrial environments.



## Next Generation Functionality

Position encoders are integrating new functionality to enable more advanced features and increase productivity. MEMS vibration sensors, such as the **ADXL371**, are being integrated into encoders to enable motor health monitoring by sensing vibration signatures that can then be used for condition-based monitoring or predictive maintenance features. Adjacent motor faults are often monitored using the industry leading low noise **ADXL359** MEMS accelerometer. In some applications, such as CNC machines, the MEMS vibration data sent from the encoder to the servo drive can be used to optimize the performance of the system in real time.



## Power Management

With the increasing deployment of more advanced manufacturing capabilities that utilize more motors with encoders, there is a need for a reduction in encoder form factor. Highly integrated power management solutions, supporting multiple voltage rails in compact footprint ICs, with high ambient temperature operation and high efficiency, help to reduce the thermal challenge within the encoder.

## Low Noise Voltage Regulators

<b>ADP120/ADP220/ADP320</b>	Single/Dual/Triple 200mA
<b>LT3023/LT3027</b>	Dual 100 mA
<b>LT3024/LT3029</b>	Dual 500 mA